VIRTUALLY IMMORTAL

A After the long, dusty drive from the city, the first surprises that visitors encounter are the shade trees and the beautiful green lawn. Then they notice the birds and monkeys swooping[1] in and out of the trees. After passing through the entrance gate, a long stone pathway leads to a place where the ground begins to open up. There, on the far side of the grasses, is what seems to be a magnificent temple built in a huge hole in the ground. However, it is not a temple, but a well.[2] This is Rani ki Vav—the Queen's Stepwell.

B The weather is dry most of the year in northwestern India. Then, during the summer, rain arrives suddenly and seeps[3] down through the sandy soil. Centuries ago, people dug holes to get at the water, and then built stone stairways down where the water collected. These stepwells were simple at first, but some later became architectural works of art. Rani ki Vav is among the most magnificent.

C Located near the Saraswati River in Gujarat, Rani ki Vav was built late in the 11th century by Queen Udayamati as a **memorial** to her dead king. It was rarely used, and by 1300, seasonal floods had filled it with sand. Not until the 1960s did Indian archeologists begin digging it out. Witnesses were **stunned** by what was hidden beneath all that sand.

Preserving the Past

D "We've seen photographs, but nothing compares with seeing it **firsthand**," says Lyn Wilson, an archeological scientist from Glasgow. With the latest in digital scanning technology, she and her colleagues from the Centre for Digital Documentation and Visualisation aim to reduce the chances that Rani ki Vav—or at least the data describing it—will ever be lost again.

E Of all the projects they have undertaken—from the Standing Stones of Stenness to Mount Rushmore—this is among the most difficult. By 12:30 p.m., their equipment arrives. As team members open the boxes, they meet their first challenge: two boxes full of Indian schoolboys on a class trip. They crowd around Wilson as though she's a Bollywood star. A guard gently directs them to move back with a long stick.

F For the next two weeks, the team will have to deal with the heat and cope with curious crowds while moving their laser beams at every surface of the stepwell in order to record the entire structure digitally. Should Rani ki Vav be damaged—through floods, war, earthquakes, or just the passage of time—there will be a precise 3-D copy available on the Internet.

[1] When an animal **swoops**, it moves suddenly down through the air in a smooth, curving motion.

[2] A **well** is a hole in the ground from which a supply of water is dug.

[3] If water **seeps** down or into something, it flows slowly through small holes in it.

LIVEWORKSHEETS

Inside the Vav

G A tour of the well reveals some of the extremely complex **carvings** the team must record. On a lower level, seven sculptures of the four-armed god Vishnu decorate the walls. Lord Kalki sits tall on a horse, one foot about to crush an enemy's head. Then there's Varaha, a god with the head of a boar.[4] A tiny goddess standing on his shoulder lovingly rubs his nose. "It reminds me of the wonderful Hollywood movie *King Kong*," remarks K. C. Nauriyal, an Indian archeologist working at the site.

H Also immortalized in stone are the Hindu gods Brahma and Shiva. Scattered among the gods slither[5] snakes and creatures called *Naga Kanya* that are half-snake, half-woman. There are also *apsaras*—female spirits of the clouds and water—putting on lipstick or earrings, **gazing** at mirrors, or drying their hair. One of them playfully strikes a monkey as it pulls down her **garment**. Another pulls on the beard of an admiring beggar. "The spice of life," Nauriyal calls them. But one wrong blow with a hammer and their beauty would be destroyed forever.

I A stairway leads to the lowest levels, and a dark passage into the well itself. Near the bottom of the well are two statues of the god Vishnu. One is sleeping on the back of a large snake, and the other is sitting straight up. There was a belief that if there were two statues of Lord Vishnu in this form, the water would never dry up—but it did. Agricultural development and a warmer climate are two likely causes. And, like the water, the sculptures may one day disappear, surviving perhaps only as a **virtual** model online.

[4] A **boar** is a wild pig.
[5] If an animal **slithers**, it moves by twisting or sliding on the ground.

A Digital Copy

J Inside a tent at the edge of the stepwell, archeologist Justin Barton **assembles** the first pieces of the 3-D digital image of Rani ki Vav. Weirdly colored **columns** and **lintels**[6] appear on the screen. The colors—greenish in the brightest areas, grading to oranges and yellows—indicate reflectivity, or how readily the laser comes **bouncing back**. Barton grabs the images with the cursor, swinging them around like a child's building blocks, fitting each into the larger model of Rani ki Vav.

K Back in Glasgow, the digital copy will be completed, ultimately joining more than a hundred others already in a computer database. But that's barely the beginning. "So much heritage is being lost on a daily basis," says Barton, "through war and human aggression, environmental changes, and the wear and tear of time." Barton and his colleagues are in a race to digitally preserve for future generations as many of the world's threatened archeological treasures as they can—before they disappear forever.

THE SCOTTISH TEN

The expedition to Rani ki Vav is part of the Scottish Ten—a digital preservation project, initiated by the government in Scotland, which aims to produce 3-D digital copies of 10 cultural sites. The Scottish Ten includes the following UNESCO World Heritage Sites:

- Rani ki Vav (India)
- Mount Rushmore (U.S.A.)
- Eastern Qing Tombs (China)
- Sydney Opera House (Australia)
- Nagasaki Giant Cantilever Crane (Japan)
- New Lanark, Neolithic Orkney, St. Kilda, Edinburgh, and Antonine Wall (all in Scotland)

LIVEWORKSHEETS

[6] A **lintel** is a piece of stone or wood over a door or window.

Laser beams are bounced off the surface of Mount Rushmore in the United States. Scanning the mountain in this way enables researchers to create a detailed 3-D digital model. This represents a new way of preserving our endangered architectural heritage.

A. Choose the best answer for each question.

DETAIL

1. **Which of these does NOT describe Rani ki Vav?**
   a. a magnificent temple
   b. a well with steps
   c. a memorial to a dead king
   d. an 11th-century structure

DETAIL
2. What happened to Rani ki Vav?
a. It disappeared underwater.
b. People took the stones away.
c. It became filled with sand.
d. Records of its existence were destroyed.

PURPOSE
3. The purpose of paragraphs G–I is to _____.
a. compare the upper and lower sections of Rani ki Vav
b. describe a recent discovery made at Rani ki Vav
c. explain how the researchers scanned Rani ki Vav
d. allow the reader to visualize the inside of Rani ki Vav

INFERENCE
4. Which statement would Justin Barton probably agree with the most?
a. We must act quickly to digitally preserve the world's archeological treasures.
b. We should discourage people from visiting heritage sites until they are digitally preserved.
c. Most of the world's important heritage sites have already been digitally preserved.
d. We should wait until there are advances in digital copying before mapping the most valuable archeological treasures.

DETAIL
5. What is the *Scottish Ten*?
a. the top 10 most visited historical sites in Scotland
b. a project to digitally preserve cultural sites
c. a team of 10 people working to preserve cultural sites
d. a type of technology used to scan monuments

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SCANNING

B. Find the following information in the passage. Note which paragraph (A–K) each item appears in.

___ 1. reasons why we are losing our cultural heritage
___ 2. a comparison to an American movie
___ 3. a description of what the lowest part of the well looks like
___ 4. a definition of *apsaras*
___ 5. two examples of other projects the *Scottish Ten* has worked on

DEFINITIONS

A. Read the information below. Match each word in red with its definition (1–5).

In 192 Howard Carter discovered the tomb of Tutankhamun, an ancient Egyptian king. When he first **gazed** upon the tomb's treasures, he was **stunned** to find they were nearly all intact. He found chests filled with ceremonial **garments** and footwear, a series of gold coffins, and the mummy of King Tut.

While it's possible to take a **virtual** tour of the tomb online, many visitors want to see it **firsthand**. But the huge numbers of tourists have damaged the tomb. So, in 2014, archeologists used laser scanners and high-definition printers to create an exact copy for tourists to see.

1. _____: **directly; from the original source**
2. _____: **looked intently at something**
3. _____: **extremely surprised**
4. _____: **items of clothing**
5. _____: **existing on computers or on the Internet**

WORDS IN CONTEXT

B. Complete the sentences. Circle the correct words.

1. Something that **bounces back** disappears / returns to you.
2. Someone might create a **memorial** before a baby is born / after a friend dies.
3. A **carving** is made by putting together / cutting into wood or stone.
4. If you **assemble** something, you put the pieces together / take it apart.
5. A stone **column** goes from wall to wall / floor to ceiling.

COLLOCATIONS

C. The nouns in the box are often used with the adjective **virtual**. Complete the sentences with the correct nouns from the box. One noun is extra.

classroom currency reality tour

1. It's possible to take a virtual _____ of the *Titanic*.
2. Virtual _____ is the next big thing in video gaming.
3. The students study with a teacher via a virtual _____.

LIVEWORKSHEETS

LURE of the LOST CITY

El Dorado. Atlantis. The Lost City of Z. Tales of fabled places have drawn generations of explorers to the most remote locations on Earth. Usually they return empty-handed—if they return at all. But sometimes the pursuit of myth can lead to real discoveries.

A

On February 18, 2015, a helicopter carrying a team of explorers headed toward the mountains of La Mosquitia, a remote area of Honduras. Below, farms gradually gave way to steep **slopes**, some covered with unbroken rain forest. The pilot headed for a V-shaped gap in a distant ridge. Beyond it lay a valley surrounded by mountains: a landscape of emerald and gold. There were no signs of human life—not a road, a **trail**, or a column of smoke. The pilot descended, aiming for a clearing along a riverbank.

B

The team had come to explore a region long thought to contain "Ciudad Blanca"—a city built of white stone, known as the Lost City of the Monkey God. One of the team members was an archeologist named Chris Fisher. Fisher didn't believe in the **legend**, but he did believe that the valley—known simply as T1—contained a secret. In fact, somewhere in this valley, he believed, were the ruins of a real lost city, abandoned for at least half a millennium. [1]

[1] A **millennium** is a period of one thousand years.

Archeologist Oscar Neil Cruz uncovers one of the flat stones encircling a ruined plaza in La Mosquitia.

The White City of Honduras

C. The Mosquitoia region of Honduras and Nicaragua contains vast areas of dense **vegetation**, swamps, and rivers. It also hides a number of dangers: deadly snakes, hungry jaguars, and insects carrying potentially deadly diseases.

D. Over time, the myth of La Mosquitia's White City became part of the Honduran national consciousness. By the 1930s, it had also captured the imagination of the American public. Several expeditions were launched to find it, including three by the Museum of the American Indian in New York City. The first two came back with rumors of a lost city containing a giant statue of a monkey god.

E. The museum's third expedition, a group led by a journalist named Theodore Morde, landed in Honduras in early 1940. Morde emerged from the jungle five months later with boxes of artifacts, claiming he had found evidence of an ancient walled city. He would not reveal the location for fear of **looting**[2], but promised to return the following year. He never did; he died in 1954. The city—if there was one—remained unidentified.

F. In the 1990s, a documentary filmmaker named Steve Elkins became **fascinated** by the legend of the White City. He spent years studying reports from explorers,

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archeologists, and geologists. He then studied **satellite** photographs of three valleys, which he labeled T1, T2, and T3 (T stands for "target"). The images, however, were inconclusive, and he realized he needed a better way to see through the dense jungle canopy[3].

G. Then, in 2010, Elkins learned of a new technology called lidar (light detection and ranging)—a way to explore the valleys from aircraft flying above the jungle. Lidar works by bouncing hundreds of thousands of **pulses**[4] of infrared laser beams off the ground below. Scanning the three valleys cost a quarter of a million dollars, but the initial results were astonishing. In an attempt to investigate the myth of the White City, Elkins had apparently **uncovered** two real ancient cities in valleys T1 and T3. To help interpret the data, he turned to Chris Fisher, a specialist on Mesoamerica.

[2] **Looting** is when people steal from homes, businesses, or tombs.

[3] A **canopy** is a layer of branches and trees that spreads out over the top of a forest.

[4] A **pulse** is a single, short burst of sound, light, or electricity.

Discoveries in the Jungle

H. This is how, in February 2015, Fisher and his team came to be in the dense jungle of La Mosquitia. Besides Fisher, who had **extensive** experience with lidar imagery, the team included two other archeologists, a group of scientists, and Elkins's camera crew.

I. The team set out from base camp, cutting a trail through the jungle with **machetes**[5]. They faced plenty of challenges—snakes, insects, mud, and constant rain. Although the area was remote, they were not alone. Animals wandered around them or gathered in the trees above, seemingly unafraid. "I've never seen anything like it," one team member noted. "I don't think these animals have ever seen human beings."

J. After climbing above the floodplain, they arrived at the base of a steep, jungle-covered highland—the edge of the presumed city. "Let's go to the top," Fisher said. Holding onto vines and tree roots, the explorers continued up the muddy slope. At the summit, Fisher pointed out the outline of a building. There was evidence of construction—probably an earthen **pyramid**. The team later identified one of the city's plazas, or large public spaces—an area of rain forest as level as a soccer field. Straight-edged mounds on three sides revealed the remains of walls and buildings.

K. By the following afternoon, the group had mapped three more plazas and many mounds. But it appeared that the river was rising, so they prepared to leave. Suddenly, one of the cameramen called out: "Hey, there are some weird stones over here."

L. At the base of the pyramid, the team found the tops of dozens of beautifully carved stone sculptures: the head of a jaguar, large jars carved with snakes, and objects that looked like seats or tables. All the artifacts were in perfect condition, apparently untouched since they had been left centuries before. There were 52 objects above ground—and probably many more below the surface.

M. In the days that followed, the team recorded each object using a 3-D scanner. Nothing was touched, nothing removed. Further expeditions to the area are now being planned with the support of the Honduran government. There is still much to learn about the former **inhabitants** of La Mosquitia. Whether or not the White City is real or myth, the search for it has led to riches.

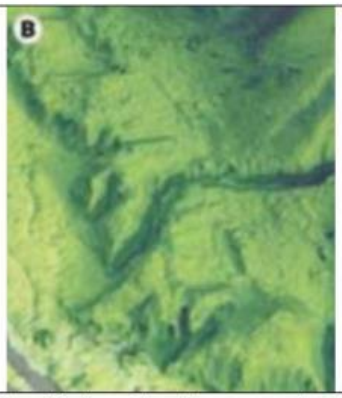
[5] A **machete** is a large knife with a broad handle, often used to clear branches.

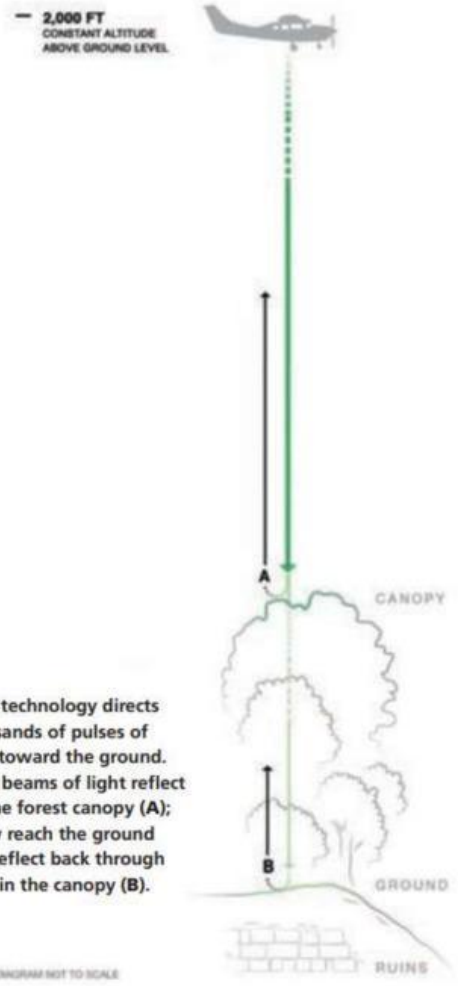
A scientific team inspects a construction stone found in La Mosquitia.

LIVEWORKSHEETS

ARCHEOLOGY FROM ABOVE

Lidar technology is revolutionizing archeology. By measuring the distance light travels to the ground and back, researchers can detect traces of ancient settlements hidden beneath the forest canopy

		
Reflected laser points are used to create a model of the forest canopy.S	By identifying the laser points that reach and reflect off the ground, researchers produce topographic maps.	Experts then look for traces of man-made structures in the area.



Lidar technology directs thousands of pulses of light toward the ground. Most beams of light reflect off the forest canopy (**A**); a few reach the ground and reflect back through gaps in the canopy (**B**).

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A. Choose the best answer for each question.

MAIN IDEA

1. According to paragraph B what were Chris Fisher's expectations as he started exploring T1?

a. He was confident the team would find the Lost City of the Monkey God.
b. He assumed the expedition would last a long time.
c. He was pretty sure the team would find some ancient ruins.
d. He thought he would meet looters in the valley.

DETAIL

2. The most conclusive evidence for the existence of a lost city came from _____.

a. satellite photos
b. rock samples taken by geologists
c. aerial photos
d. lidar images

DETAIL

3. Which of the following is NOT mentioned as one of the challenges faced by Fisher's team?

a. wild animals
b. unfriendly local tribes
c. muddy ground
d. rainy weather

SEQUENCE

4. The first sign that Fisher's team had discovered a lost city in T1 was the indication that _____ had once been there.

a. a pyramid
b. a plaza
c. straight-edged mounds
d. stone carvings

DETAIL

5. Which of the following did the team NOT observe in the T1 valley?

a. flat areas once used as public spaces
b. animals that were not scared of humans
c. large buildings shaped like animals
d. well-preserved stone sculptures

EVALUATING STATEMENTS B. Are the following statements true or false according to the reading passage, or is the information not given? Circle T (true), F (false), or NG (not given).

1. The Lost City of the Monkey God is also known as La Mosquitia.

T F NG

2. Theodore Morde's expedition to the Mosquitia region was sponsored by the Museum of the American Indian.

T F NG

3. The artifacts that Morde brought back included sculptures.

T F NG

4. It is likely there are more artifacts under the ground in T1.

T F NG

5. Fisher's team took the artifacts back to the U.S. for further study.

T F NG

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COMPLETION

A. Circle the correct words to complete the information below.

The city of El Dorado has [1]**fascinated** / **uncovered** people for hundreds of years. When Spanish explorers reached South America in the 16th century, they heard about a wealthy city in what is now Colombia. The city's [2]**inhabitants** / **vegetation** owned so much gold that their chief threw gold jewels into the lake to please the gods. The Spaniards started calling this chief El Dorado; later, the name was used for the city itself.

Some researchers believe the **legend** / **trail**[3] of El Dorado may contain some truth. They hope to **uncover** / [4]**slope** the mystery using high-tech tools such as [5]**satellite** / **pyramid** technology. However, despite **extensive** / [6]**inhabited** searching, the fabled city of El Dorado, if it exists, remains hidden.

WORDS IN CONTEXT

B. Complete the sentences. Circle the correct words.

1. The **slope** of a mountain is its *side* / *peak* / *bottom*.
2. You are likely to follow a **trail** in your *house* / *an ocean* / *a forest*.
3. **Vegetation** refers to *plants, trees, and flowers* / *green vegetables* / *fruit*.
4. The sides of a **pyramid** are usually in the shape of a *square* / *triangle* / *circle*.

WORD USAGE

C. The words *legend, myth,* and *folktale* are often confused with one another. A legend is a very old story that may be partly true. A myth often tells a story of creation or of a supernatural being. A folktale is a popular story passed down orally. Write the type of story next to each of these examples.

1. The German fairy tale "Hansel and Gretel" tells of a witch who kidnaps and holds two children before they eventually escape.
2. The Roman hero Hercules, the son of a god and a woman, is famous for his strength and unbelievable adventures.
3. The tales of Robin Hood describe the adventures of a man who may have lived in England's Sherwood Forest hundreds of years ago.

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